Seminar on Energy Development in the Greater Mekong Subregion

Energy Sector in Cambodia

Presented by

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Outline

1. Overview of Cambodia
2. Recent Macroeconomic Development
3. Current Condition of Energy Sector in Cambodia
4. Hydropower Sector
5. Rural Electrification
6. Future Demand
7. Policy Responses
8. Plan of the Energy Sector

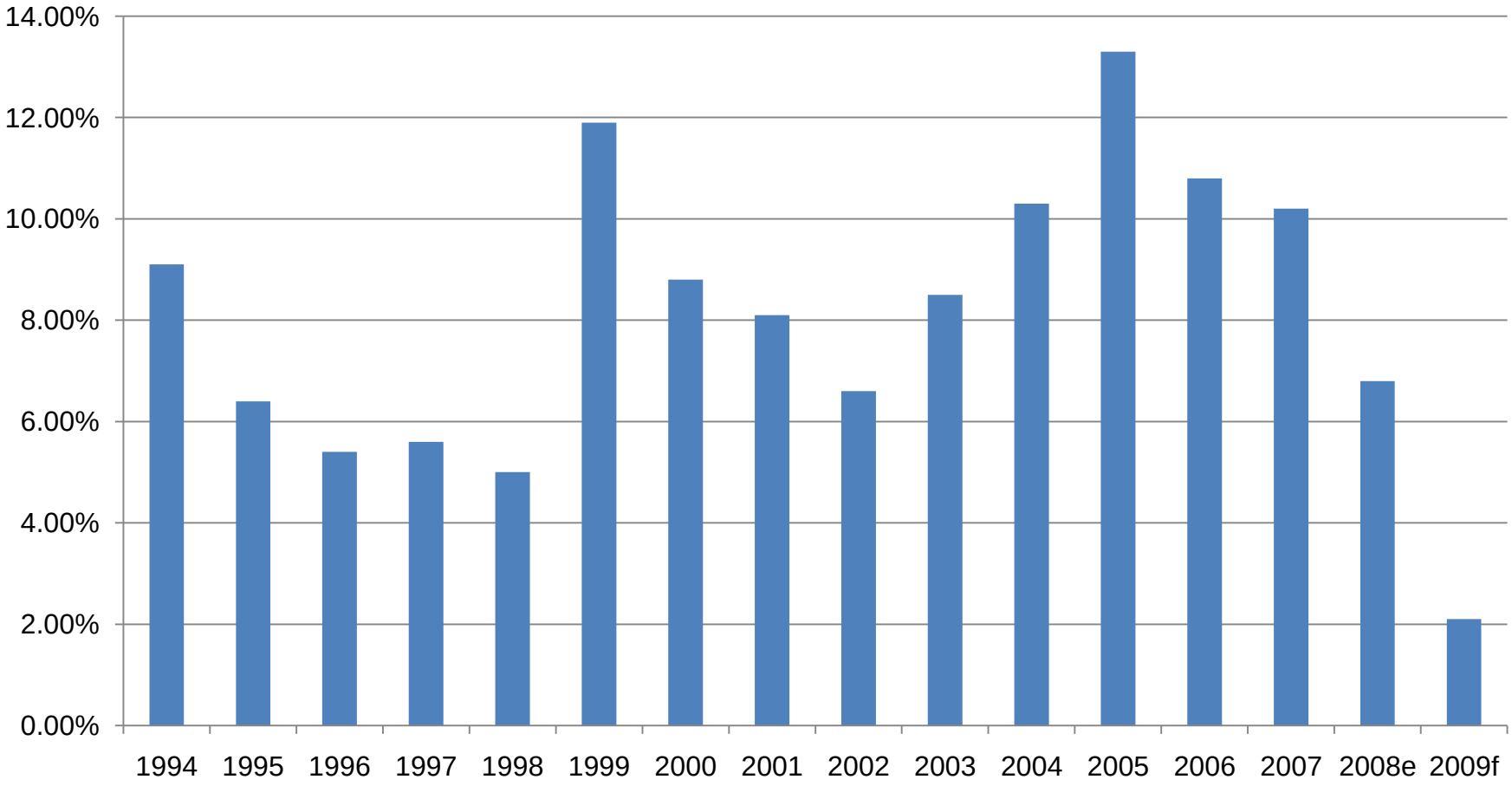
1- Overview of Cambodia (2008 Census)

- Territory: 181,035 sq.km
- Population: 13,395,682
- Population Growth Rate: 1.54 percent
- Rural Population: 80.5 percent
- Density (sq.km): 75 persons
- GDP: US$ 739 per capita
- Literacy Rate: 77.6 Percent,

  Male: 85.1, Female: 70.9

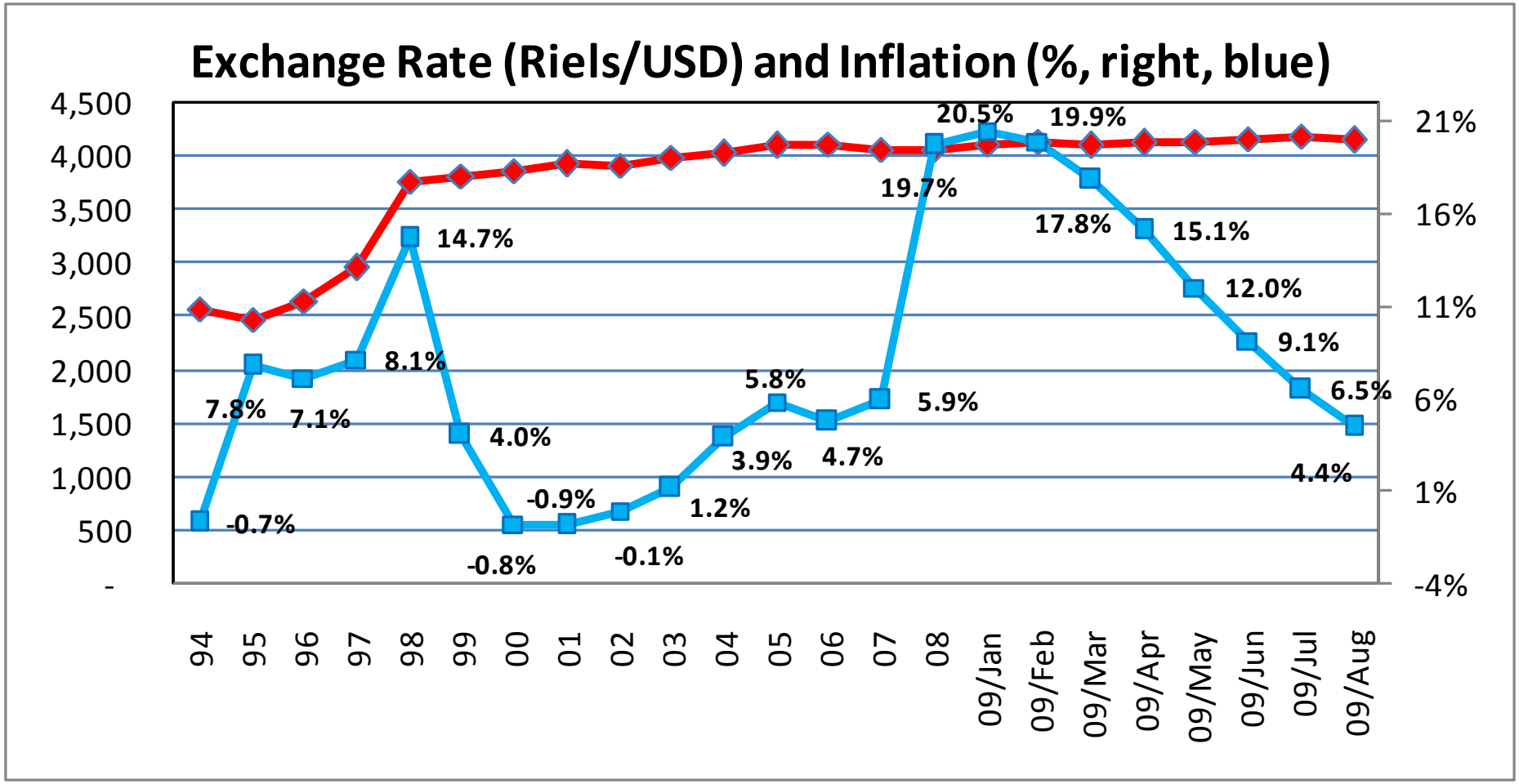
2- Recent Macroeconomic Development

GDP Growth Rate



Source: Ministry of Economy and Finance

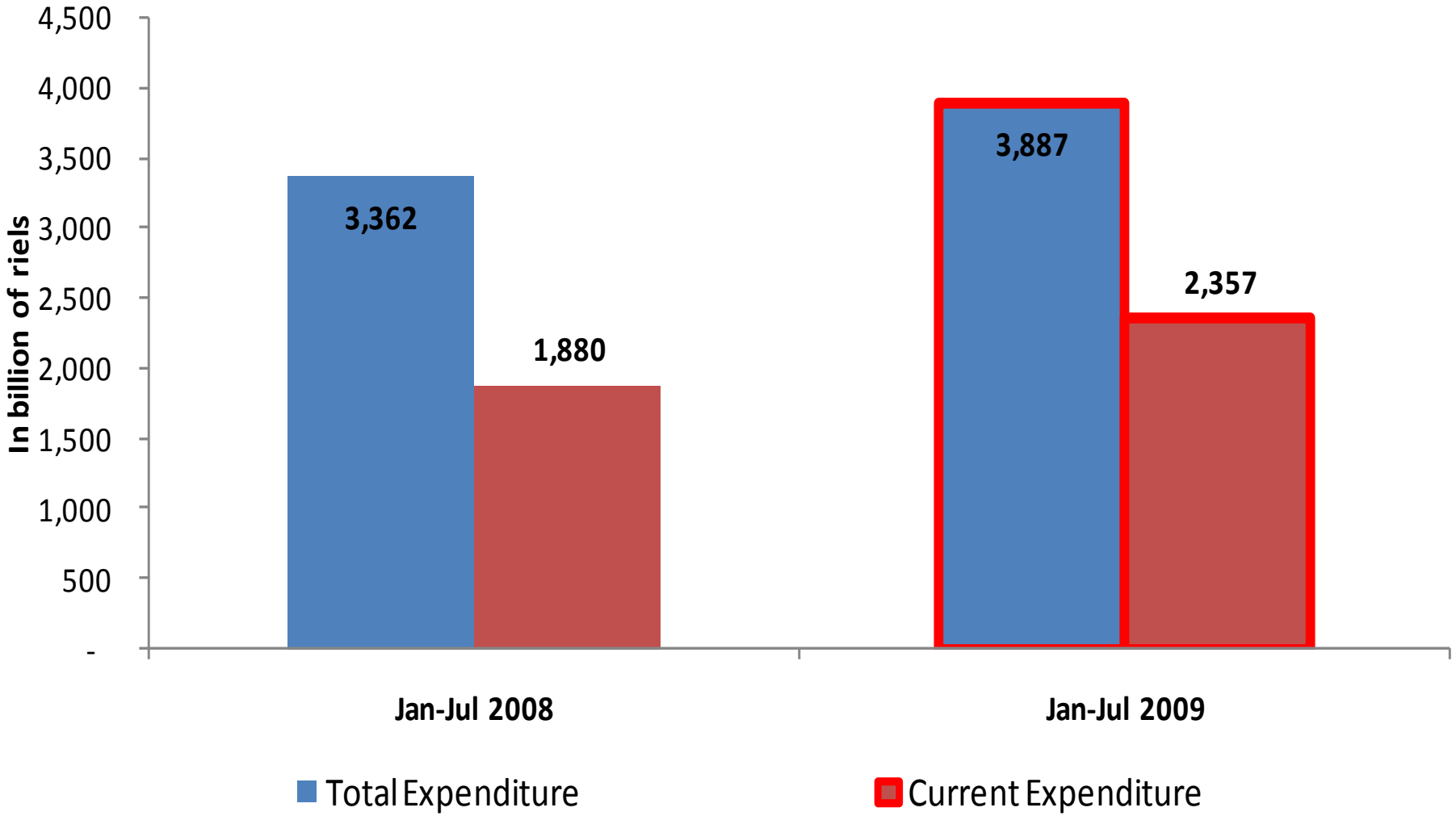
Exchange rate is stable while inflation subsided



•Since the beginning of 2009, inflation has reduced dramatically from 20.5% in Jan. to 4.4% in Aug., while USD/Riels exchange rate remains stable.

Source: Ministry of Economy and Finance

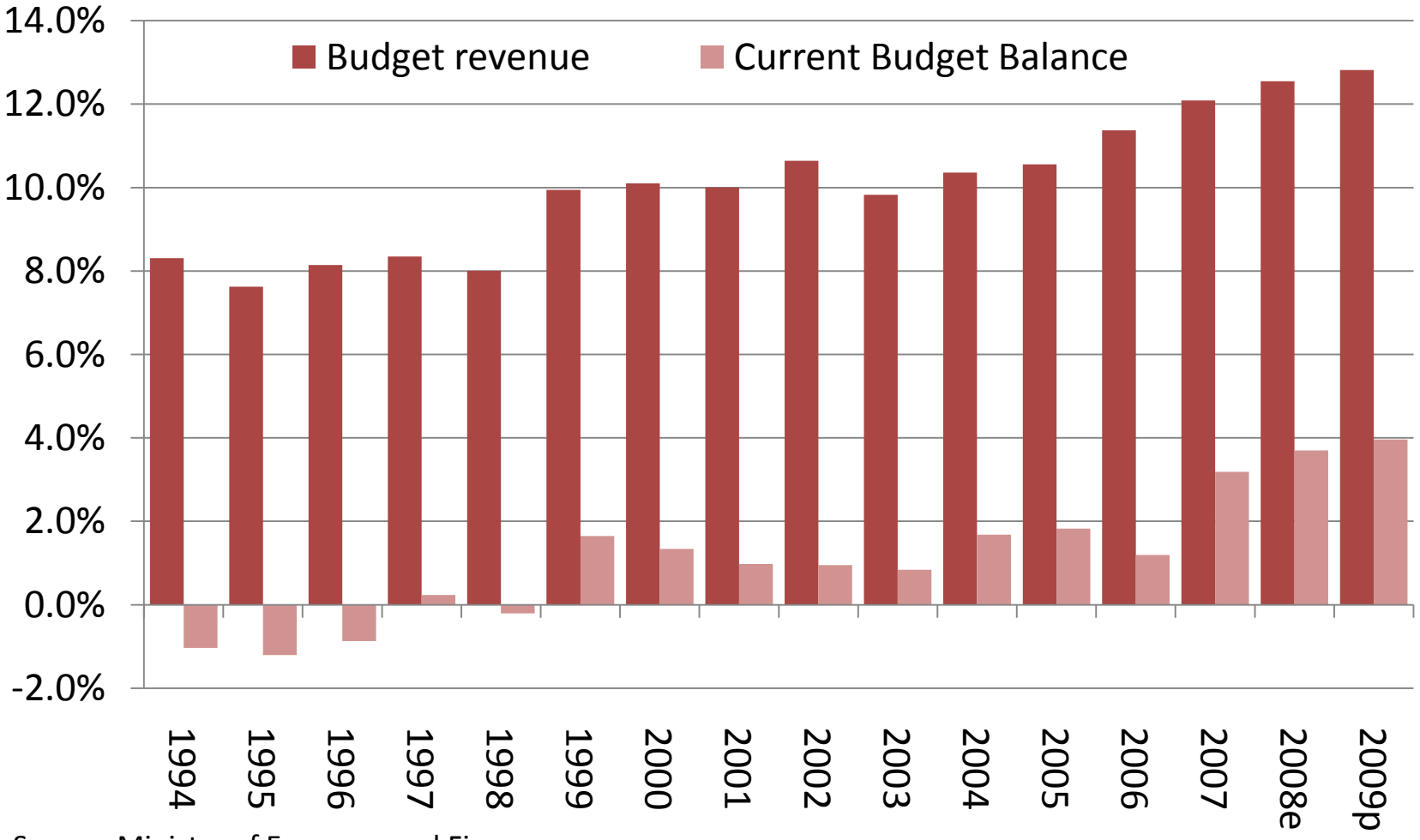
Expenditure Performance: 2009 vs. 2008



- Total expenditure increased by 15.6% in Jan-Jul 2009 compared to the same period in 2008.

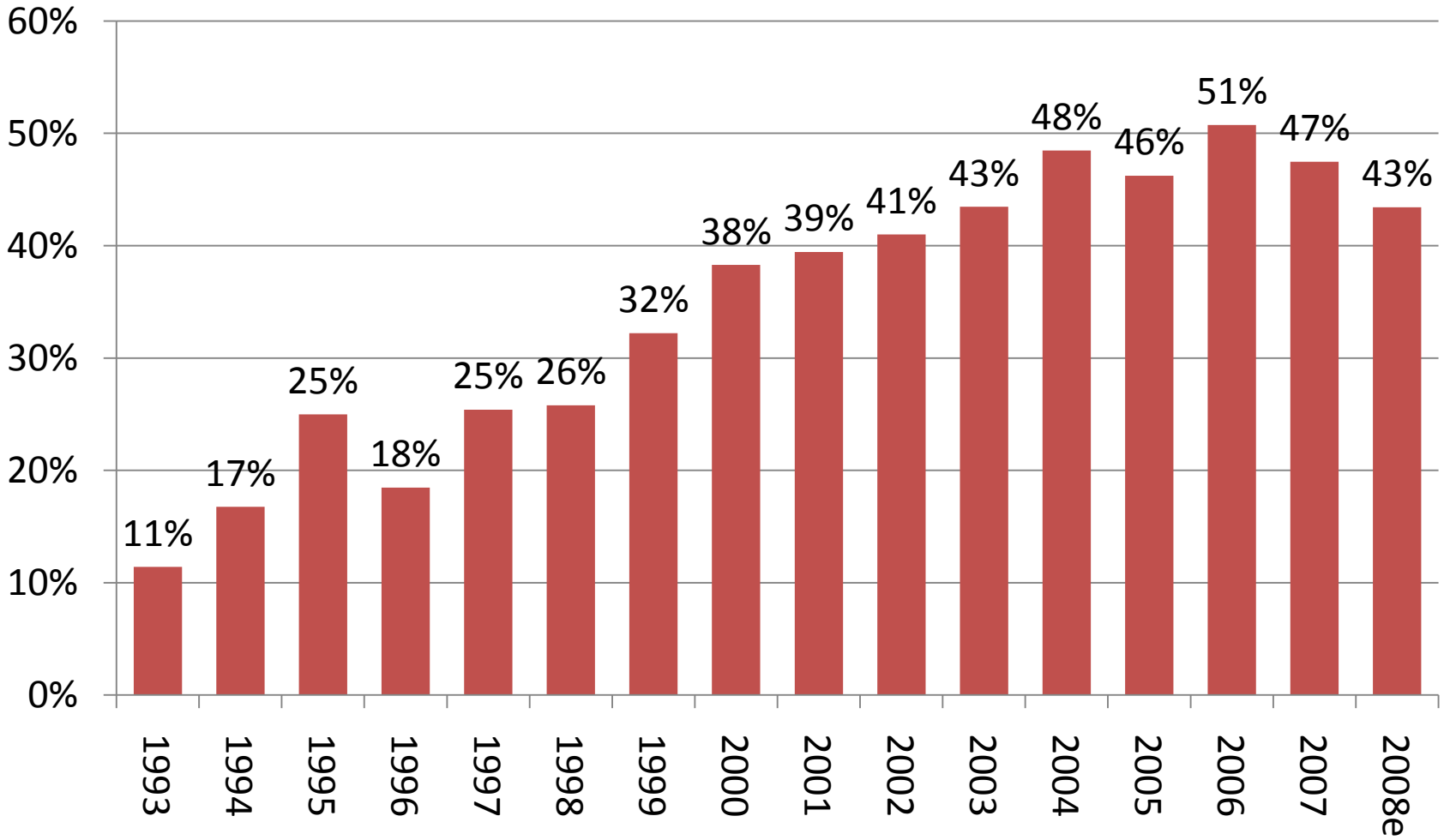
Source: Ministry of Economy and Finance

Fiscal position remains strong due to ongoing reform efforts (PFM)

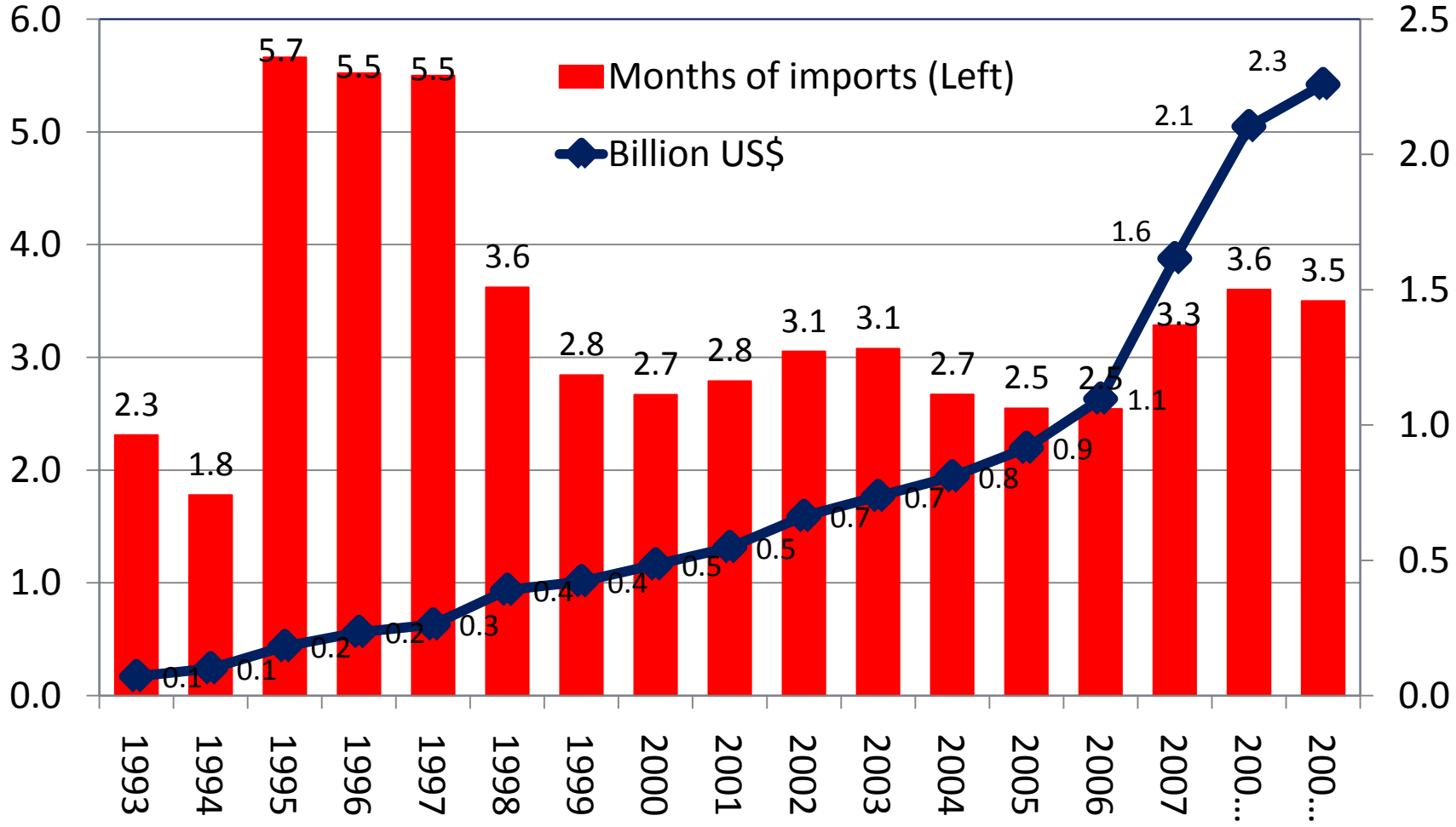


Source: Ministry of Economy and Finance

Export was slowing

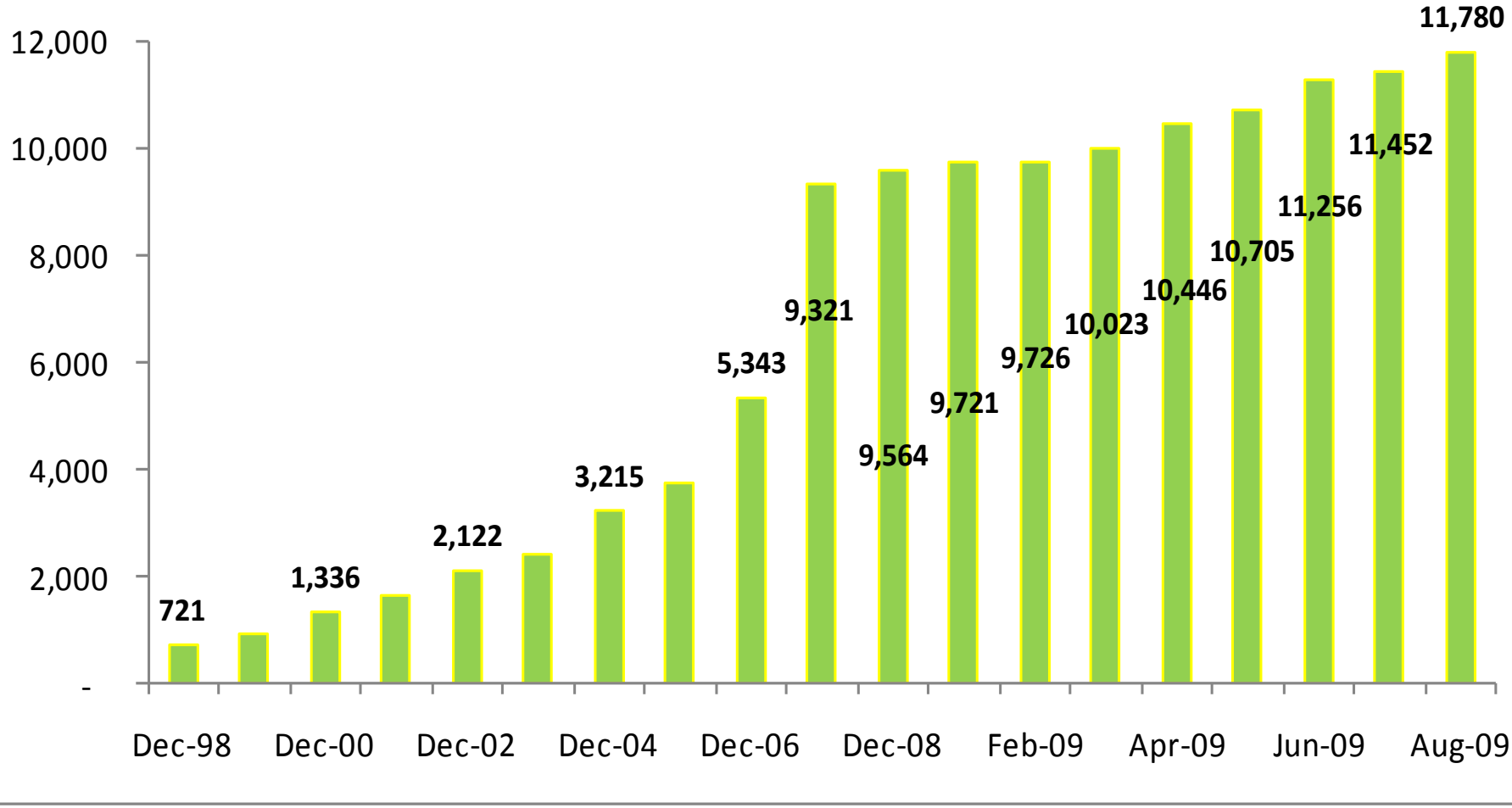


International Reserves are high

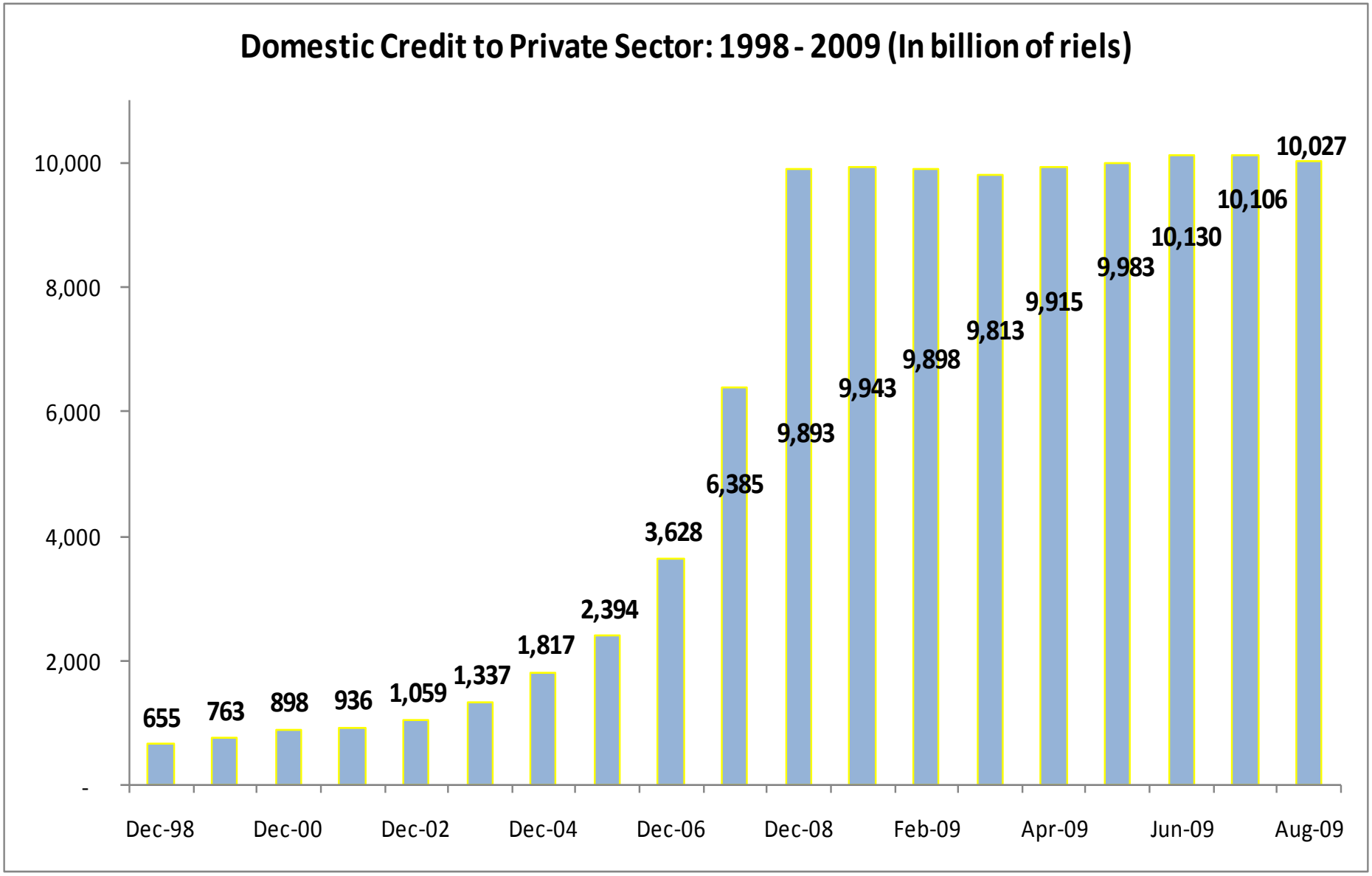


Source: Ministry of Economy and Finance

Bank Deposits: 1998 - 2009
(In billion of riels)

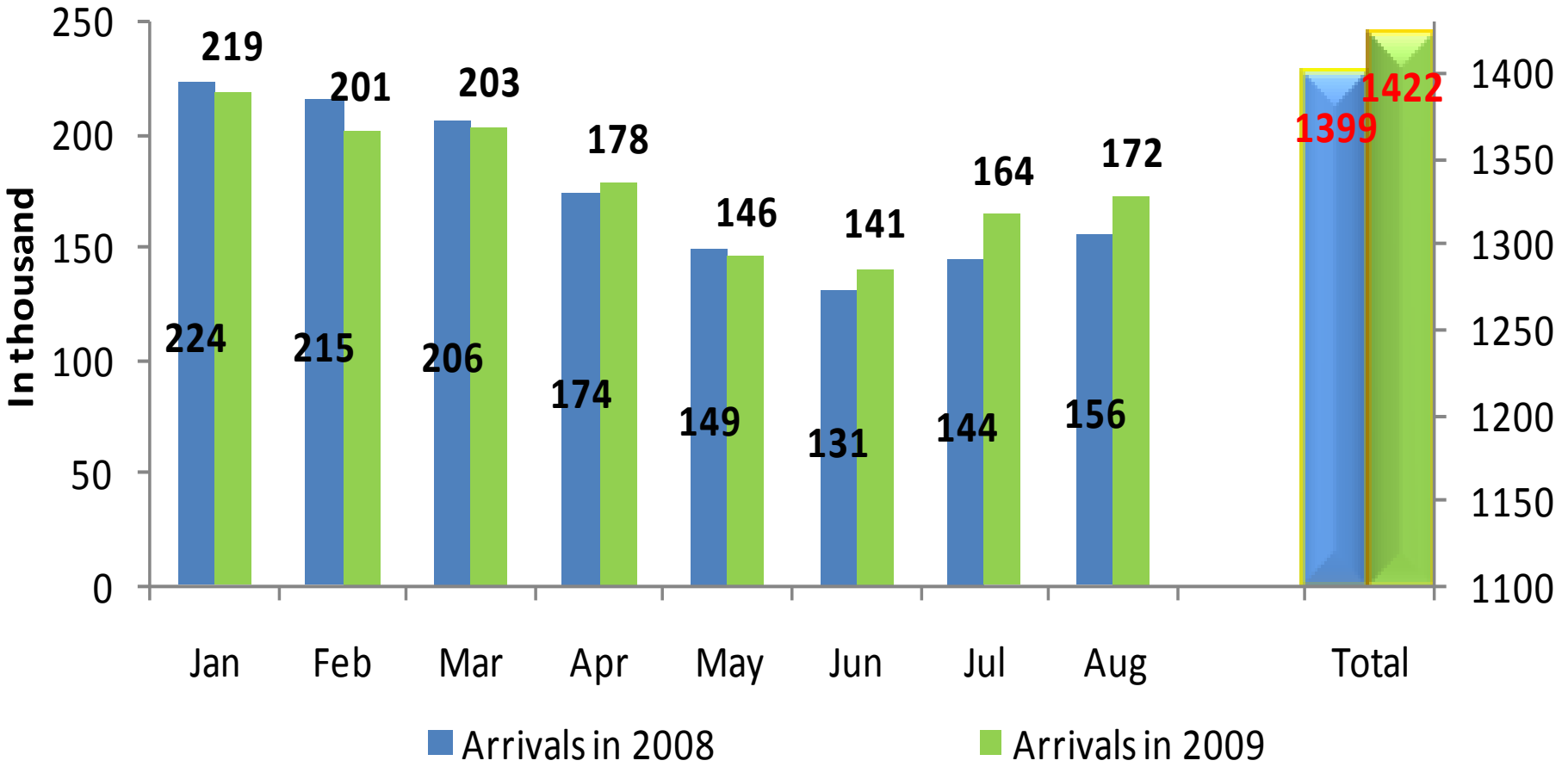


- Bank deposits during Jan-Aug 2009 continued to increase on average by 2.6%. It reached 11.7 trillion Cambodian Riels in Aug.



- Credit to the private sector broadly remained stable at around 10 trillion Cambodian Riels during the second half of 2009.

Tourist Arrivals in Cambodia: 2008 vs. 2009



•Tourist arrivals increased by 2% during Jan-Aug 2009 compared to the same period in 2008.

3- Current Condition of Energy Sector in Cambodia

Overview of Energy Sector in Cambodia

- The electricity supply in Cambodia is fragmented into 24.
- Isolated power systems center in provincial towns and cities.
- Mostly reliant on diesel power stations.
- No national grid and most towns are supplied through isolated systems.
- About 10 percent of the population (mostly in Phnom Penh) consumes 90 percent of the electricity.
- Average tariff is around US$0.16 cents/kWh,
- Tariffs in rural areas is from US$0.30-0.90/kWh.
- Annual energy consumption per capita in 2008 is 103Kwh

- Percentage of households having electricity as main source of light (2008 Census): Total: 26.4, Urban: 87 and Rural: 13.1

- The average increment of electricity supply in Phnom Penh was 15% for 2003 to 2006 and 26% for 2007 to 2008.

- Total capacity of electricity supply of EDC in Phnom Penh City in 2008 is 210 MW

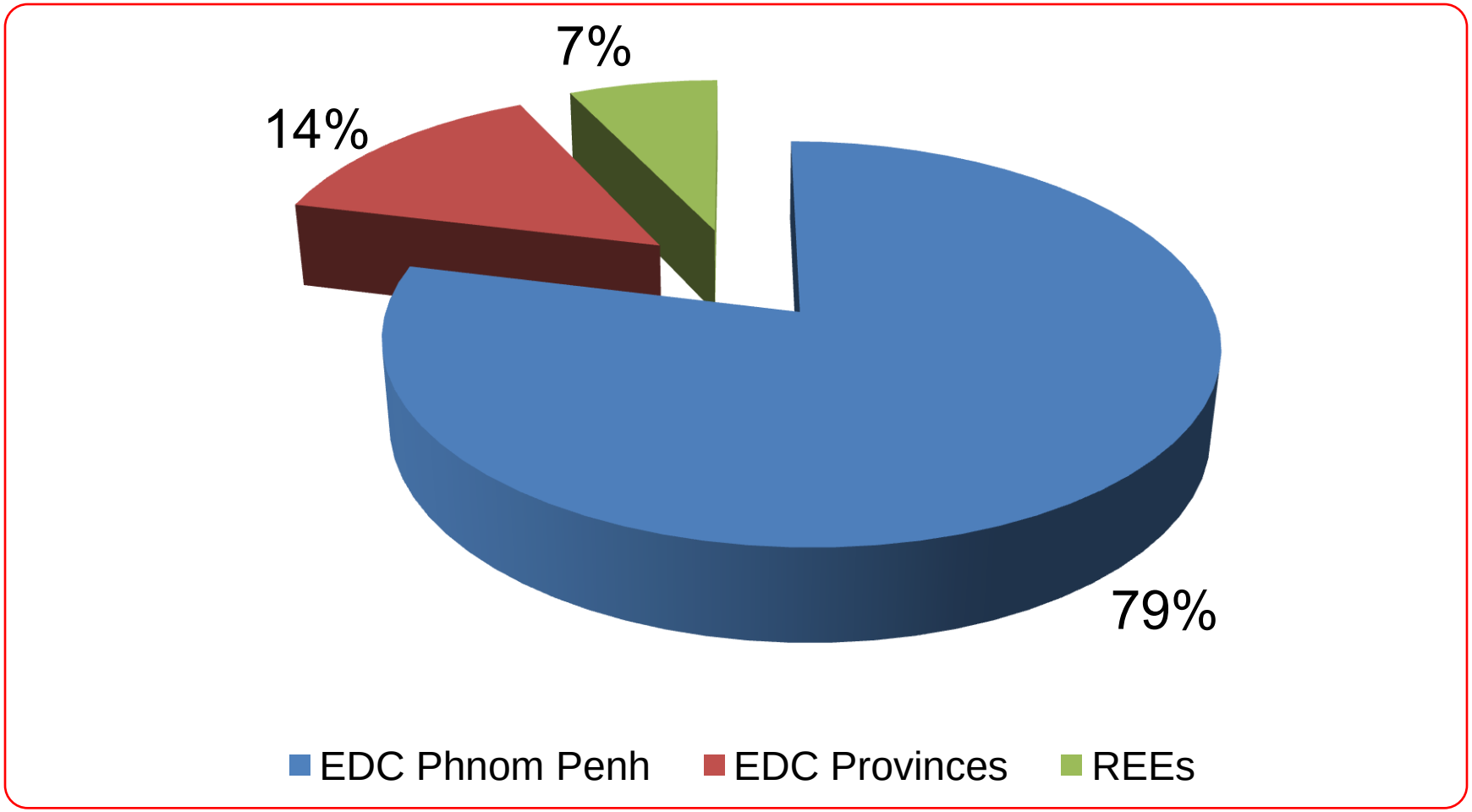
- Some regions on the Vietnam and Thai border are supplied electricity imported by EDC and other private companies from 1998. In fact, in 2008 the capacity of electricity imports was 57 MW.

- Due to the small size of generation, dependence on high cost imported oil, the lack of a high voltage transmission system and the big losses in distribution, the electricity price is very high compared to some countries in the region.

Governing Institutions

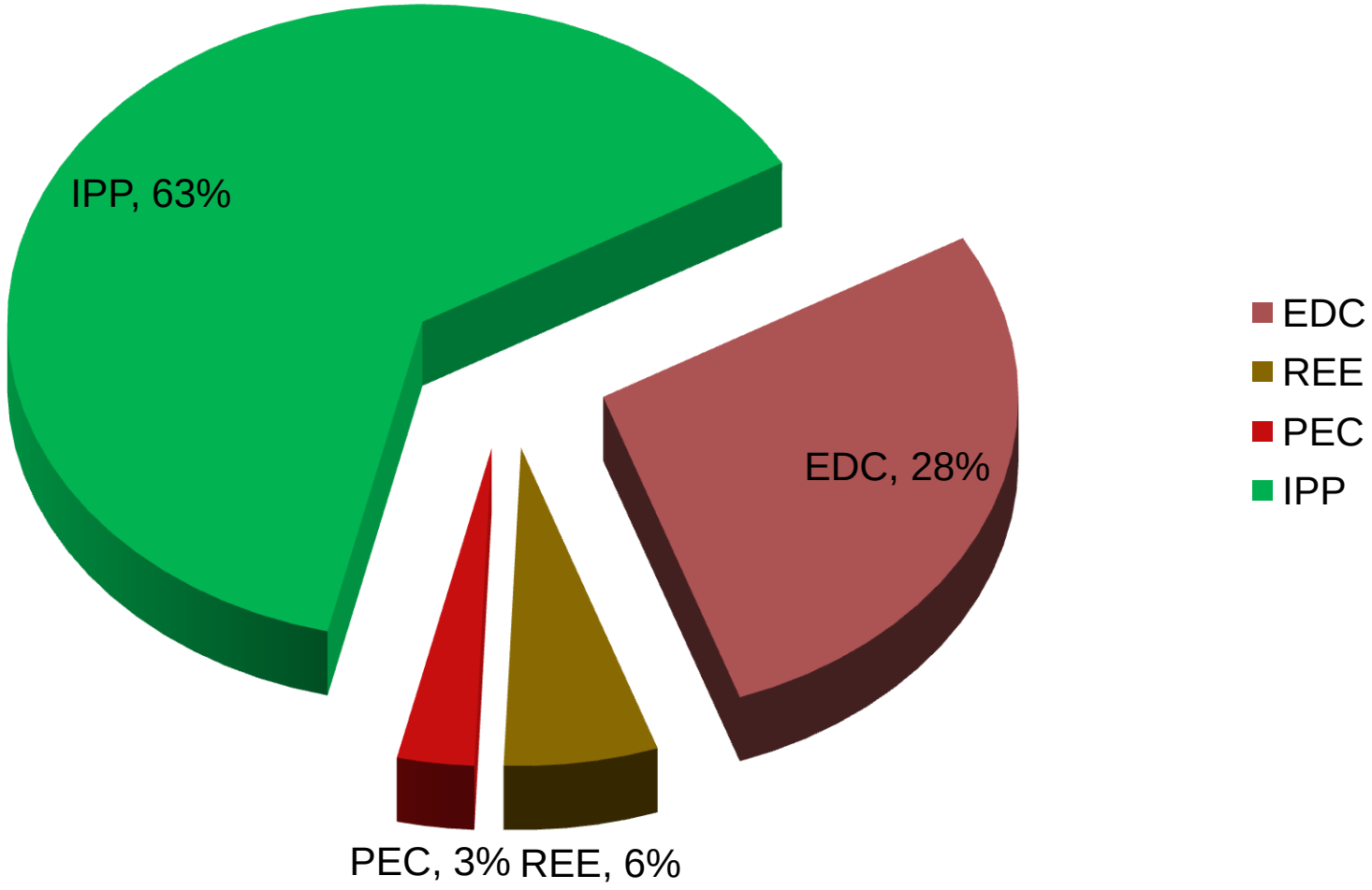
1- Ministry of Industry, Mine and Energy
   - Policy makers
   - Planning
   - Strategies
2- Electricity Authority of Cambodia
   - Regulator (enforcing regulation, procedures and standard for investment program)
   - Tariff rate setting
   - Licensing
3- Electricity du Cambodge (EDC)
   - Generation
   - Transmission
   - Distribution
4- Cambodia National Petroleum Authority
   - Manage and develop both downstream and upstream of oil and gas

Energy Use by Areas (2007)



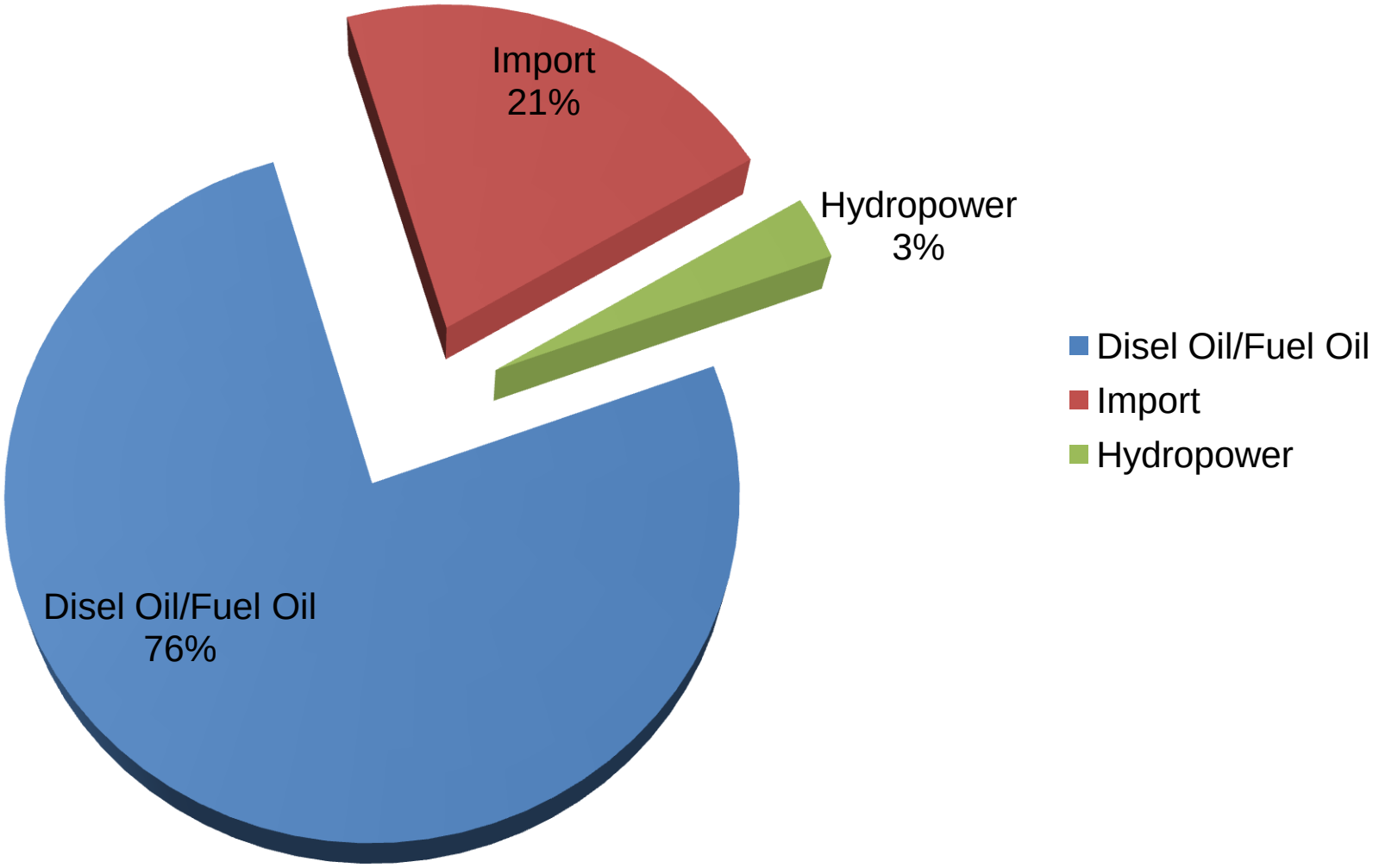
Source: Ministry of Industry, Mines and Energy

Electricity Generation by Supplier 2008, 385 MW



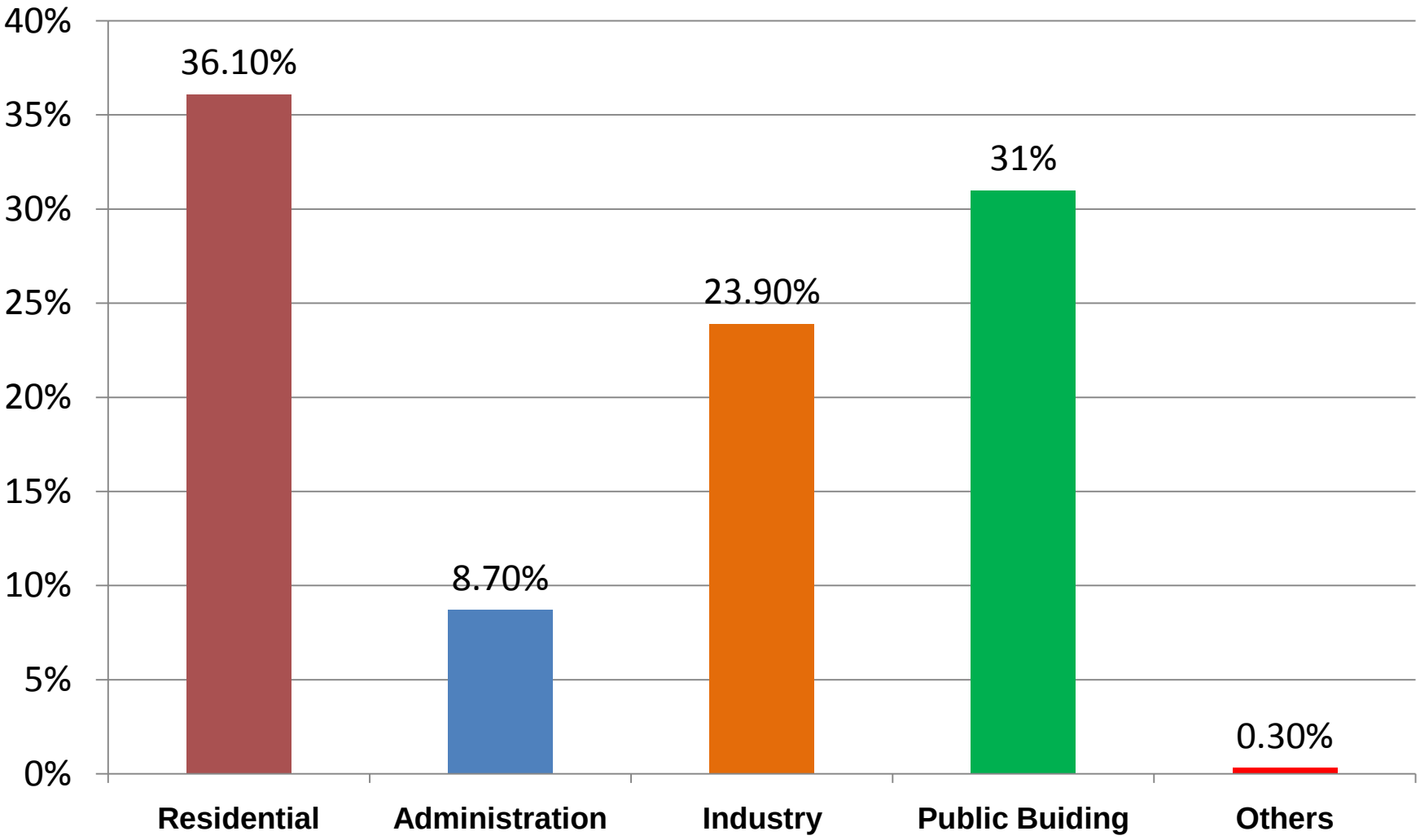
Source: Ministry of Industry, Mines and Energy

Electricity Generation by Fuel Type 2008, 385 MW



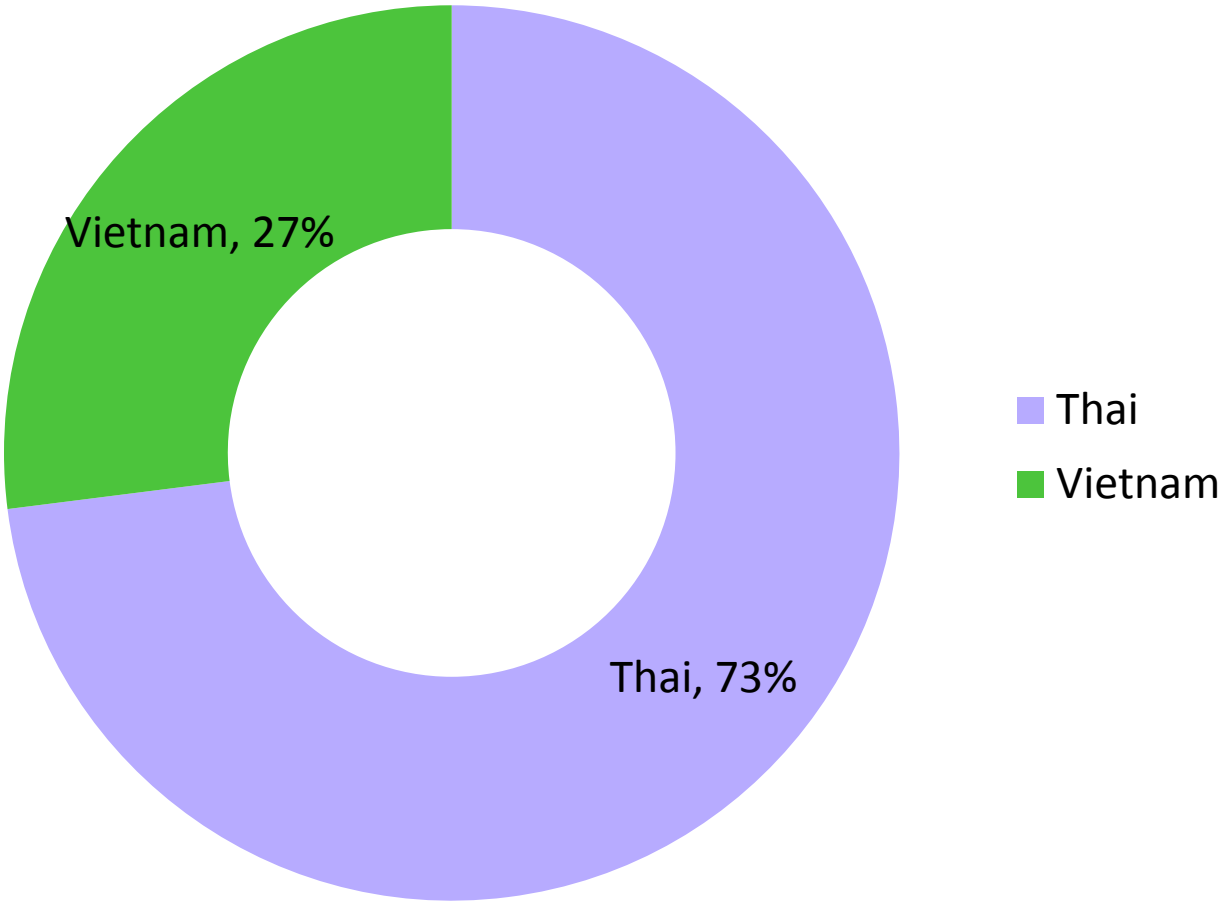
Source: Ministry of Industry, Mines and Energy

Electricity Consumption by Sector in 2007



Source: Ministry of Industry, Mines and Energy

Importation of electricity in 2008



Source: Ministry of Industry, Mines and Energy

Alternative Sources of Energy

- Hydropower
- Solar Energy: Measurement during 1981-88, at Phnom Penh, average sunshine duration of 6-9 hours per day with high average of 5 $kWh/m^2/day$
- Biomass and Biogas
- Wind Energy
- Oil and Gas

4. Hydropower Sector

Cambodia has substantial hydropower resources. The hydropower potential of Cambodia was estimated in 1995 with the theoretical potential of about 10,000 MW exclude small streams and will play a significant role in the long-term energy development.

Hydropower Projects from 2008 to 2020

- Implemented Plants (3 plants)

No	Plant's Name	Capacity (MW)	IA/PPA/LA	Company	Country	Year Operation
1	Kirirom 1 Hydro Power	12	BOT	CETIC	China	2002
2	Orchum Hydro Power	1		EDC	Cambodia	1993
3	The Smallest Hydro Power in Modul Kiri Province (Oromeur, Orumleng)	0.37				2009

Source: Ministry of Industry, Mines and Energy

- Plants under Constructed (6 plants)

No	Plant's Name	Capacity (MW)	IA/PPA/LA	Company	Country	Year Operation
1	Kamchay Hydro Power	193	BOT	Synohydro	China	2010
2	Kirirom 3 Hydro Power	18	BOT	CETIC	China	2010
3	Coal Power 3 Factory	200	BOO	Synergy	Cambodia	2011
4	Stung Atay Hydro Power	110	BOT	CYC	China	2012
5	Stung Rusey Chrum Krom Hydro Power	338	BOT	Michelle Cooperation	Cambodia	2014
6	Stung Tatay Hydro Power	246	BOT	Chinese	CHMC	2015

Source: Ministry of Industry, Mines and Energy

Plants with signed MoU on Feasibility Study (10 plants)

No	Plant's Name	Capacity (MW)	IA/PPA/LA	Company	Country	Signed Date
1	Sambor Hydro Power	2,600	F/S	--	China	10-2006
2	Stung Chhay Areng Hydro Power	108	F/S	--	China	10-2006
3	Sesan Krom 1 Hydro Power	90	F/S	--	Vietnam	06-2007
4	Sesan Krom 2 Hydro Power (Include Srepok Krom 2 Plan)	420	F/S	EVN	Vietnam	06-2007
5	Stung Treng Hydro Power	980	F/S	--	Russia	02-2008
6	Stung Pursat 1 Hydro Power	75	F/S	--	China	04-2008
7	Srepok Krom 3 Hydro Power	330	F/S	--	China	06-2008
8	Srepok Krom 4 Hydro Power	235	F/S	--	China	06-2008
9	Stung Svaslab Hydro Power	3.8	PFS	NETi		06-2008
10	Prek Chhlong 2 Hydro Power	25		CAMDARA	Singapore	06-2008
	Total	**4, 867 MW**				

Source: Ministry of Industry, Mines and Energy

Plants that have authorized letter to study (11 plants)

No	Plant's Name	Capacity (MW)	IA/PPA/LA	Company	Country	Signed Date
1	Stung Rusey Chrum Kandal and Leu Hydro Power	125 & 32	PFS	KTC	Korea	15-12-2006
2	Battambong 1 Hydro Power	24	PFS	KTC	Korea	26-06-2007
3	Battambong 2 Hydro Power	36	PFS	KTC	Korea	26-06-2007
4	Sesan Krom 3 Hydro Power	375	PFS	KTC	Korea	16-10-2007
5	Prek Liang 1 Hydro Power	64	F/S	KTC	Korea	16-10-2007
6	Prek Liang 2 Hydro Power	64	F/S	KTC	Korea	16-10-2007
7	Stung Sen Hydro Power	40	F/S	KTC	Korea	04-2008
8	Osla Leu Hydro Power	2	PFS	BFP	India	25-09-2008
9	Osla Krom Hydro Power	4.5	PFS	BFP	India	25-09-2008
10	Phnom Tunsoang Leu Hydro Power	3	PFS	BFP	India	25-09-2008
11	Phnom Tunsoang Krom Hydro Power	3.1	PFS	BFP	India	25-09-2008
	Total	**772.6 MW**				

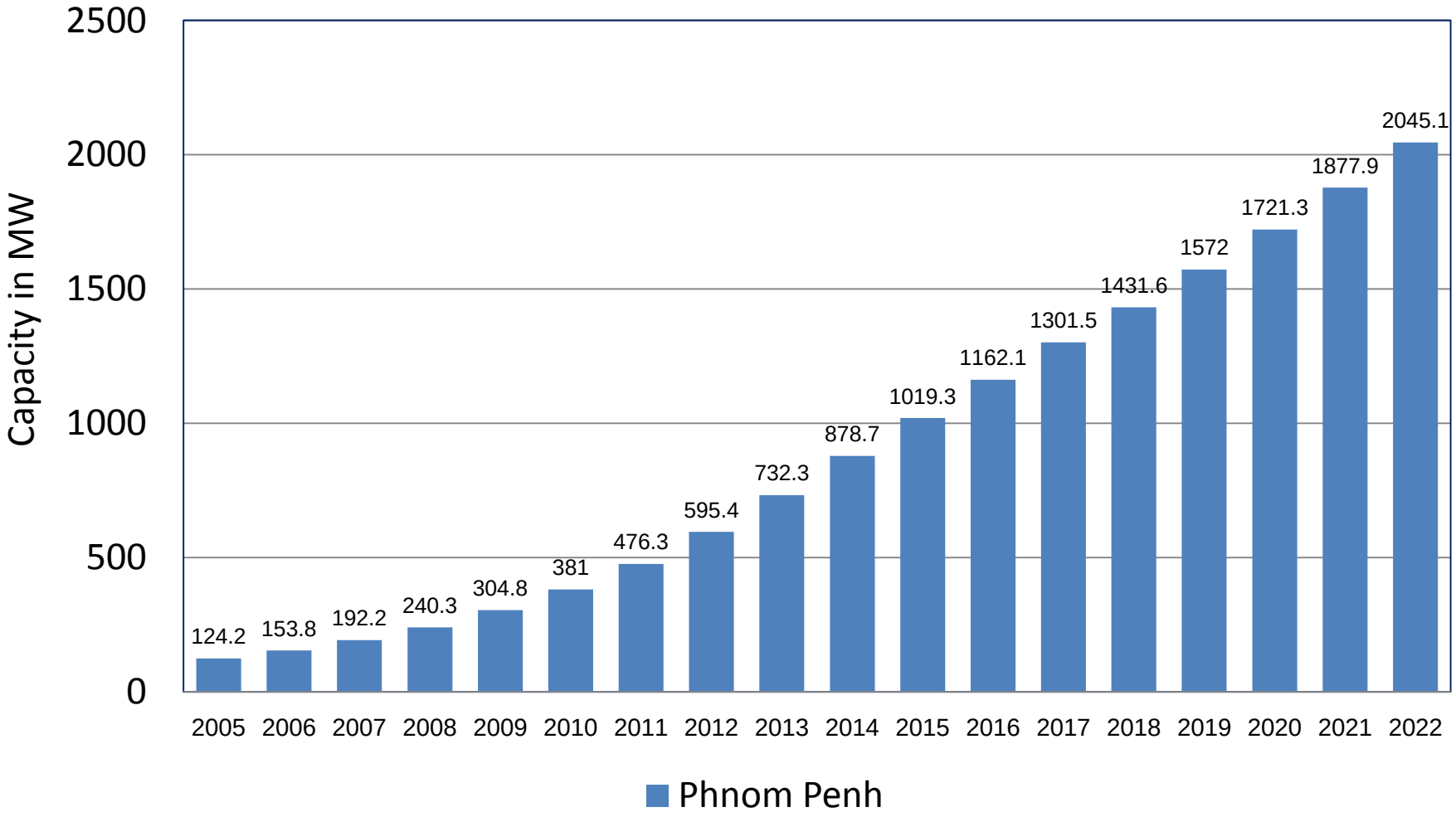
Source: Ministry of Industry, Mines and Energy

5. Rural Electrification

- Reconstruction of the electricity infrastructure has been completed in 8 provinces
- Renewable energy master plan study
- Subsidize part of rural electrification projects
- Electricity generation in every provincial town beside Phnom Penh City in charge of EDC is only 23 MW in 2003 and increase to 46 MW in 2007.
- RGC has plan to increase rural electricity coverage from around 13 percent at present to 70 percent by 2030 by Rural Electricity Enterprises
- At present, beside the electricity regions supplied by EDC, some others Rural Electricity Enterprise (REE) supply 30 MW to 113 rural regions and distribute electricity to 67,321 households (EAC, 2007).

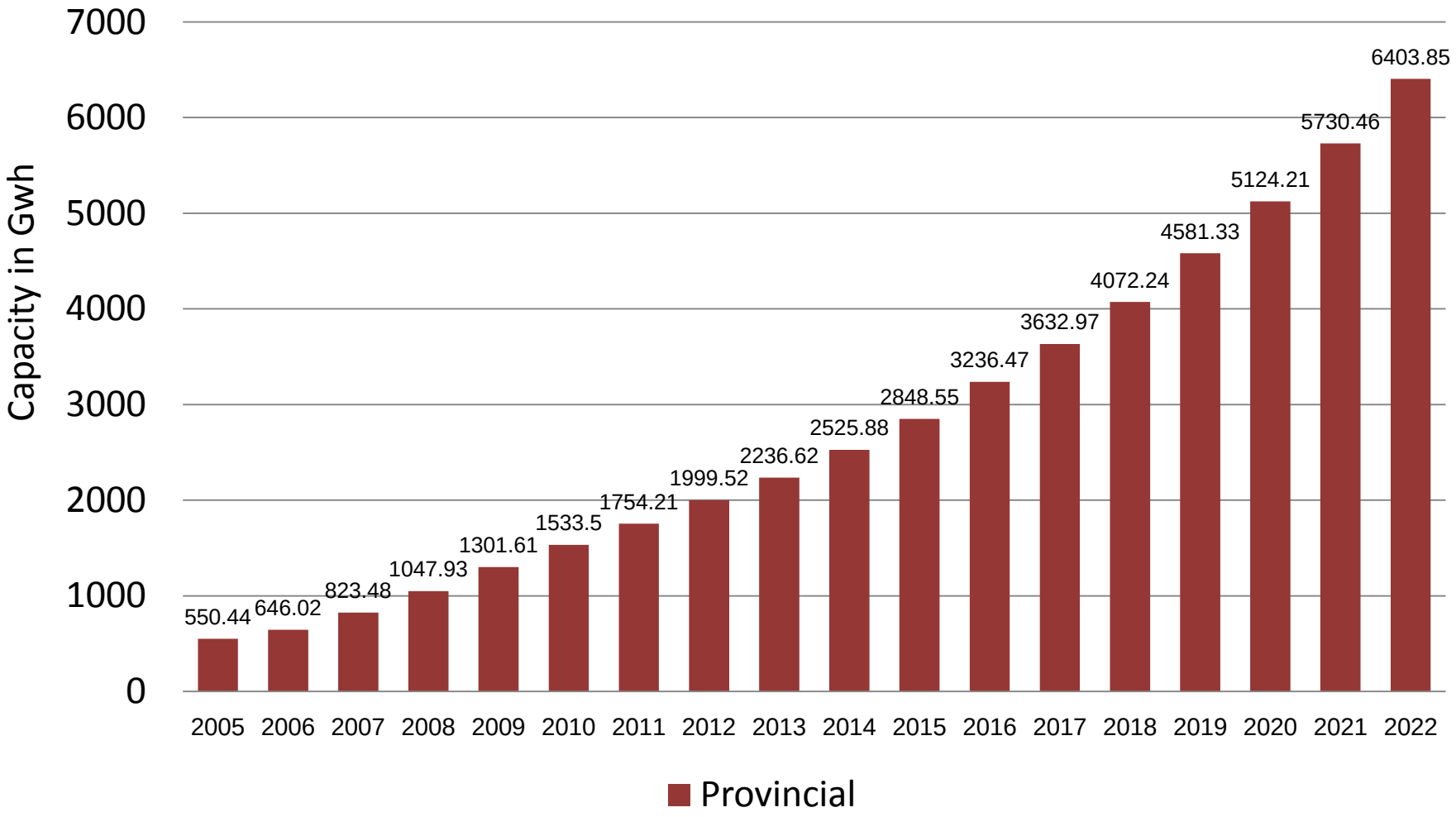
6. Future Demand

Electricity Demand in Phnom Penh 2005-2022



Source: EDC

Electricity Demand in Provinces/Towns 2005-2022



Source: EDC

7. Policy Responses

"the high cost of utilities creates a heavy burdens on businesses. Cambodia should consider attracting further electricity investment and increasing the competitiveness of this important horizontal enabler that remains one of the main binding constraints to competitiveness." (Cambodia Country Competitiveness, UNDP, 2009)

Rectangular Strategy

- The RGC attaches priority to increase electricity supply capacity and reduce tariff to an appropriate level while strengthening institutional mechanism and management capability. The diversification of energy resources and the creation of the reserve generating capacity in the system are key to ensure energy security in Cambodia. The RGC encourages the construction of low cost electricity generating plants by using local energy sources such as hydro power, natural gas, and coal and pursues the import of electricity from neighboring countries.
- The RGC encourages construction of electricity transmission lines covering all parts of the country to enable the supply of quality and low cost energy from all sources to meet the demand in cities, provinces, urban and rural areas; and will gradually integrate Cambodia's electricity energy system into the networks of the Greater Mekong Sub-region (GMS) countries and ASEAN.

Rectangular Strategy (Cont.)

- In order to reduce poverty and ensure harmony in the lives of people in the rural areas, the Royal Government will continue to attach priority to accelerate rural electrification, including the use of renewable energy.
- The RGC encourages the private sector to invest in energy infrastructure, including generation, transmission and distribution. The Royal Government will make further efforts to mitigate adverse effects on environment and society in the implementation of energy projects while safeguarding economic efficiency of each project. The RGC encourages the use of efficient energy with minimal impact on the environment.
- The RGC considers oil and gas resources as a unique potential to ensure energy security and as valuable resources for long term economic development of Cambodia.

8. Plan of the Energy Sector

Development Plan on Electricity Generation 2008-2020

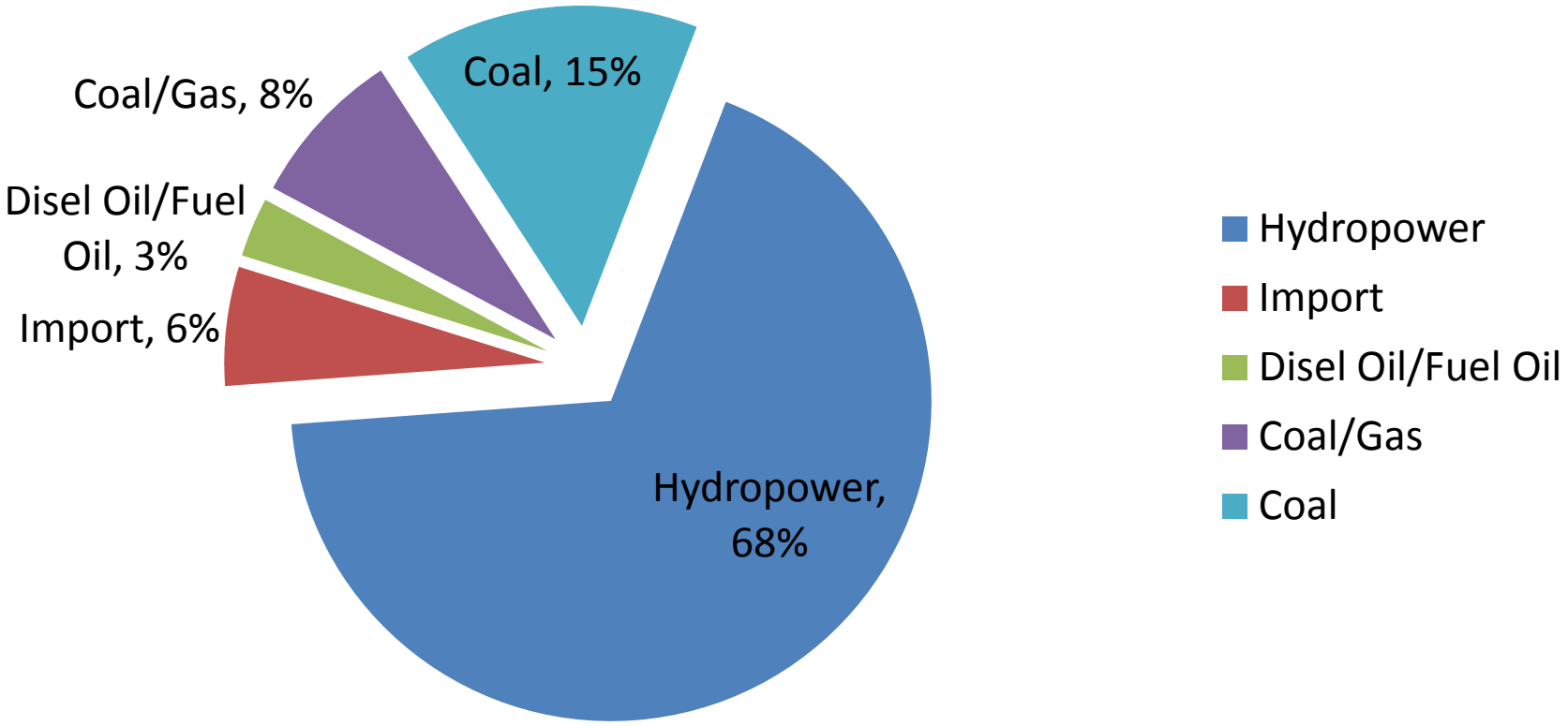
No	Electricity Generation Plan	Fuel	Capacity (MW)	Year Operation
1	Kirirom 3 Hydro Power Factory	Hydro Power	18	2010
2	Start Operation Kamchay Hydro Power	Hydro Power	193	2010
3	Start Operation the 1st Stage of Coal Power Factory 1, 200 MW at Sihanouk Ville	Coal	100	2011
4	Start Operation Stung Atay Hydro Power	Hydro Power	110	2012
5	Start Operation the 2nd Stage of Coal Power Factory 1, 200 MW at Sihanouk Ville	Coal	100	2012
6	Start Operation the 1st Stage of Coal Power Factory 2, 700 MW Capacity	Coal	100	2013
7	Start Operation Stung Reussey Chrum Krom Hydro Power	Hydro Power	338	2013
8	Start Operation the 2nd Stage of Coal Power Factory 2, 700 MW Capacity	Coal	100	2014
9	Start Operation Stung Atay Hydro Power	Hydro Power	246	2015
10	Start Operation the 3rd Stage of Coal Power Factory 2, 700 MW Capacity	Coal	100	2015
11	Start Operation the 4rd Stage of Coal Power Factory 2, 700 MW Capacity	Coal	100	2016

Source: Ministry of Industry, Mines and Energy

No	Electricity Generation Plan	Fuel	Capacity (MW)	Year Operation
12	Start Operation Sesan Krom 2 Hydro Power include Srepok Krom 2 Plan	Hydro Power	420	2016
13	Start Operation Stung Chhay Areng Hydro Power	Hydro Power	108	2017
14	Start Operation the 5rd Stage of Coal Power Factory 2, 700 MW Capacity	Coal	100	2017
15	Start Operation Additional Coal Power at the seaside, 700 MW	Coal	200	2018
16	Start Operation Sambor Hydro Power	Hydro Power	2,600	2019
17	Start Operation Coal Power Factory 3 or National Gas	Coal or Gas	450	2020
	Total		**5,383.00**	

Source: Ministry of Industry, Mines and Energy

Electricity Supply Plan by Fuel Type in Year 2020, 6000 MW



Source: Ministry of Industry, Mines and Energy

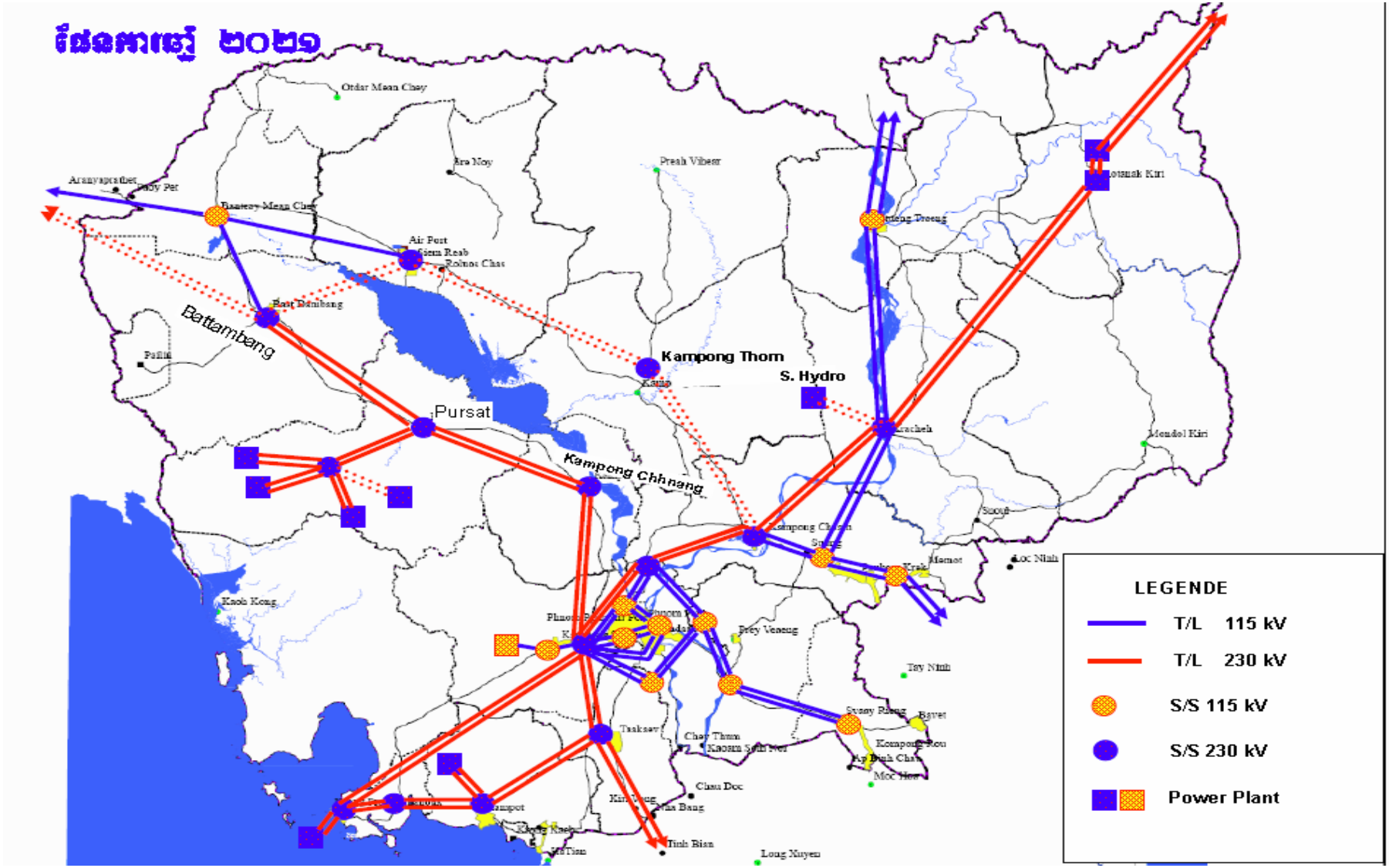
Plan for Grid Network Development

No.	Grid Networks	Year Operation	T/L (km)
1	115 kV, Kirirom I - Phom Penh, BOT	2001	120
2	115 kV, Thailand - Bantey Meanchey - Siem Reap – Battambong, BOT	2007	203
3	220 kV, Phnom Penh - Takeo - Viet Nam, (construct the substation in Takeo), (ADB + NFD)	2009	110
4	115 kV, Reinforcement of transmission line and construct substation at WPP (West Phnom Penh), (WB)	2009	30
5	230 kV, Takeo - Kompot, (construct substation in Kompot), (KFW)	2011	87
6	115 kV, Steung Treng - Loa PDR, (construct substation in Steung Treng), (WB)	2011	56
7	110 kV, Kampong Cham - Viet Nam, Substations: Soung, - Pongnearkreak BOT	2011	68
8	230 kV, Kampot - Sihanouk Ville, (construct 2 substations: - Vealrinh - Sihanouk Ville), (ADB + JBIC)	2011	82
9	230 kV, Phnom Penh - Kompong Chhnang - Pursat - Battambong, (construct 3 substations: - Kompong Chhnang, - Pursat, - Battambong), BOT	2012	310
10	230 kV, Pursat - Osom, (construct 1 substation in Osom Commune), BOT	2012	175
11	230 kV, Kampong Cham – Kratie, BOT	2012	110

No.	Grid Networks	Year Operation	T/L (km)
12	230 kV, Kratie – Stung Treng, (India)	2012	126
13	230 kV, Phnom Penh – Kampong Cham, BOT	2012	100
14	220 kV, Phnom Penh – Sihanoukville, along national road 4, BOT	2013	220
15	230 kV, Phnom Penh – Neakleung – Svay Rieng, (construct 2 substations: - Neakleung, - Svay Rieng), BOT	2014	120
16	230 kV, Stung Tatay Hydro – Osom substation, BOT	2015	15
17	115 kV, West Phnom Penh – East Phnom Penh (construct substation GS4 at South Phnom Penh), BOT	2015	20
18	230 kV, Reinforcement of transmission line on the existing pole, Phnom Penh – Kampong Cham (transmit power from Lower Sesan II + Lower Srepok II)	2017	100
19	230 kV, Stung Chay Areng - Osom substation, BOT	2017	60
20	230 kV, Kampong Cham - Kampong Thom - Siem Reap, (construct 1 substation in Kampong Thom), BOT	2019	250
Total Transmission Line			**2,362**

Source: Ministry of Industry, Mines and Energy

National Grid Plan 2021



Source: EDC

Electricity Import from Neighboring Countries

- 2009: 200 Mw from Vietnam at high voltage 220kv
- 2011: 20 Mw from Vietnam through Kompong Cham province
- 2011: 20 Mw from Vietnam through Steung Treng
- 2018: Power Interconnection at high voltage 500Kv, Lao, Cambodia-Vietnam

Source: Ministry of Industry, Mines and Energy

Thank You

Q & A